EVALUATION OF MICROBIOME DIVERSITY OF AQUAPONIC SYSTEM AND THEIR EFFECT ON PHYTOPATHOGENS AND PLANT GROWTH

By

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B.Sc. Agric. Sc. (Plant Pathology), Fac. Agric. Ain Shams Univ., 2005

M.Sc. Agric. Sc. (Agric. Microbiology), Fac. Agric. Ain Shams Univ., 2015

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ABSTRACT

Nerhan Abd El-Salam Eid Abd El-Aal: Evaluation of Microbiome Diversity of Aquaponic System and Their Effect on Phytopathogens and Plant Growth. Unpublished Ph.D. Thesis, Department of Agric. Microbiology, Faculty of Agriculture, Ain Shams University, 2020.

The Egyptian aquaponic system is exposed to several environmental problems, such as; bacterial leaf spot disease which equal adverse effect on market value as well as pollution resulting from the accumulation of fish sludge. This study was conducted to evaluate leaf spot disease and the bacterial causative pathogens as well as to obtain an effective bioformulation to supress the disease and mineralization of fish sludge. Bacterial leaf spot incidence (%) and viable count of pathogenic bacteria were recorded of several plants grown in six different aquaponic farms in Egypt during 2016. Based on morphological and biochemical characterization and disease symptoms, the bacterial isolates belonged to the genera *Xanthomonas* and *Pseudomonas*. Pathogenicity test and host range of these isolates were determined on different plants. More virulence pathogenic bacteria of *Xanthomonas* sp. and *Pseudomonas* sp. were identified giving high identities with *Xanthomonas campestris* and *Pseudomonas cichorii*. Growth promoting bacterial isolates (538 isolates) had been isolated from different plants. Four hundred eighteen bacterial isolates didn't induce hypersensitive reaction. Forty isolates showed variation in their potentiality of antagonistic activity against seven strains of *X. campestris* and four strains of *Ps. cichorii in vitro*. The assessment of cyanide, siderophore, IAA, gibberellins, phenolic compounds production, nutrient solubilization and enzymatic activity for selected antagonistic bacteria were revealed that, there was ten bacterial isolates have high potentiality. Collected sludge was treated by these bacteria and was analysed for element composition after 5 and 10 days. The selected isolates (5 isolates) were identified as: *Bacillus vallismortis*, *Bacillus velezensis*, *Bacillus safensis*, *Pseudomonas taiwanensis*, *Pseudomonas*

putida. Sodium alginate microbeads exerted high stability for viable count of loaded bacterial strains during 90 days of storage. Further evaluation, under the aquaponic conditions, the alginate microbeads increased growth parameters, total chlorophyll, carotenoids, enzyme activities of basil plants and growth of tilapia fish within two cuttings in presence of phytopathogenic bacteria, as well as led to decrease leaf spot incidence. Sodium alginate microbeads were added in sand filter and clarifier tank of an aquaponic trail for sludge mineralization. The sand filter achieved high values of all measured parameters of plant, water and fish.

Keywords: Aquaponic system, basil plant, bacterial leaf spot disease, bioformulation, Sludge mineralization, Biocontrol, *Xanthomonas campestris, Pseudomonas cichorii.*

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